

CLAIMS

1. A process of manufacturing a hollow plastic product with two open ends and a substantially tubular section, the process comprising the steps of:

5 (a) providing a cavity mold part with a generally cylindrical portion for forming at least an outside segment of the substantially tubular section of the product;

(b) providing a core mold part with a generally cylindrical portion for forming at least an inside segment of the substantially tubular section of the product;

10 (c) combining the cavity mold part with the core mold part to configure a mold cavity for forming a product with one open end, one closed end and a substantially tubular section;

(d) injecting plastic material into the mold cavity to form the molded plastic product;

15 (e) separating the core mold part from the cavity mold part while retaining the molded product on the core mold part;

(f) injecting compressed air into the closed end of the molded product to thereby at least help remove the molded product from the core mold part; and

(g) removing at least a portion of the closed end of the molded product to provide the molded product with two open ends and a substantially tubular section.

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2. A process according to Claim 1, wherein step (f) comprises the step of:

(h) injecting compressed air through the core mold part into the closed end of the molded product.

3. A process according to Claim 1, wherein the product further includes a thread at the outside of one end of the product,

wherein step (a) comprises the step of:

5 (h) providing a said cavity mold part that includes a thread-forming portion for forming the thread of the product;

wherein step (b) comprises the step of:

(i) providing a said core mold part that includes a movable inner core for forming a portion of the product lying inside the thread when the inner core is protracted;

wherein step (c) further comprises the step of:

10 (j) protracting the inner core to further configure the mold cavity for forming the product;

wherein the process further comprises the step of:

(k) subsequent to injection of the plastic according to step (d), retracting the inner core; and

15 wherein separation of the core mold part from the cavity mold part according to step (e) thereby removes the thread from the thread-forming portion of the cavity mold part.

4. A process of manufacturing a hollow plastic product with a substantially tubular section and a thread at the outside of one end of the product, the process comprising the steps of:

5 (a) providing a cavity mold part with a generally cylindrical portion for forming at least an outside segment of the substantially tubular section of the product and a thread-forming portion for forming the thread of the product;

10 (b) providing a core mold part with a generally cylindrical portion for forming at least an inside segment of the substantially tubular section of the product and a movable inner core for forming a portion of the product lying inside the thread when the inner core is protracted;

(c) combining the cavity mold part with the core mold part and protracting the inner core to configure a mold cavity for forming the product;

(d) injecting plastic material into the mold cavity to form the molded plastic product;

15 (e) retracting the inner core; and

(f) separating the core mold part from the cavity mold part to thereby remove the thread from the thread-forming portion of the cavity mold part while retaining the molded product on the core mold part.

5. A process of removing an injection-molded hollow plastic product with a substantially tubular section, two open ends and a thread at the outside of one end of the product from a core mold part, the process comprising the steps of:

- (a) closing the threaded end of the molded product; and
- 5 (b) injecting compressed air into the molded product to loosen the molded product from the core mold part.

6. A process according to Claim 5, wherein step (a) comprises the step of:

- (c) attaching a closure having a matching thread onto the threaded end of the

10 product.

7. A process according to Claim 6, wherein step (c) comprises the step of:

- (d) robotically using a robotic arm to attach the threaded closure onto the threaded end of the product.

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- 8. A process according to Claim 7, wherein the robotic arm includes the threaded closure.

9. A process according to Claim 6, wherein the threaded closure is a plastic cap.

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- 10. A process according to Claim 9, further comprising the step of:
 - (d) injection molding the plastic cap in the injection molding system in which the product is injection molded.

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- 11. A process according to Claim 10, wherein step (d) comprising the step of:
 - (e) injection molding plastic caps at the same average rate as the products are injection molded.

12. Apparatus for manufacturing a hollow plastic product with two open ends and a substantially tubular section, comprising:

a cavity mold part with a generally cylindrical portion for forming at least an outside segment of the substantially tubular section of the product;

5 a core mold part with a generally cylindrical portion for forming at least an inside segment of the substantially tubular section of the product;

wherein a mold cavity for forming a molded product with one open end, one closed end and a substantially tubular section is configured when the cavity mold part is combined with the core mold part, and the molded product is formed by injecting plastic 10 material into the mold cavity;

means for injecting compressed air into the closed end of the molded product to thereby at least help remove the molded product from the core mold part after the core mold part has been separated from the cavity mold part while retaining the molded product on the core mold part; and

15 means for removing at least a portion of the closed end of the molded product to provide the molded product with two open ends and a substantially tubular section.

13. Apparatus according to Claim 12, wherein the core mold part includes means for channeling compressed air through the core mold part into the closed end of the 20 molded product.

14. Apparatus according to Claim 12, wherein the product further includes a thread at the outside of one end of the product,

wherein the cavity mold part includes a thread-forming portion for forming the thread of the product;

5 wherein the core mold part includes a movable inner core for forming a portion of the product lying inside the thread when the inner core is protracted;

 wherein the mold cavity for forming the molded product with a thread at the outside of one end of the product is configured when the cavity mold part is combined with the core mold part and the inner core is protracted; and

10 wherein the apparatus comprises:

 means for separating the core mold part from the cavity mold part after the inner core is retracted to thereby remove the thread from the thread-forming portion of the cavity mold part while retaining the molded product on the core mold part.

15. Apparatus for manufacturing a hollow plastic product with a substantially tubular section and a thread at the outside of one end of the product, comprising:

a cavity mold part with a generally cylindrical portion for forming at least an outside segment of the substantially tubular section of the product and a thread-forming portion for forming the thread of the product;

a core mold part with a generally cylindrical portion for forming at least an inside segment of the substantially tubular section of the product and a movable inner core for forming a portion of the product lying inside the thread when the inner core is protracted;

wherein a mold cavity for forming a molded product with a substantially tubular section and a thread at the outside of one end of the product is configured when the cavity mold part is combined with the core mold part and the inner core is protracted, and the molded product is formed by injecting plastic material into the mold cavity;

means for separating the core mold part from the cavity mold part after the inner core is retracted to thereby remove the thread from the thread-forming portion of the cavity mold part while retaining the molded product on the core mold part.